

PSYCHE.

THE INSECTS OF *BETULA* IN NORTH AMERICA.

BY ANNA KATHERINA DIMMOCK, CAMBRIDGE, MASS.

(Concluded from p. 243.)

Amphidasys cognataria Guenée (Hist. nat. d. ins., 1857, v. 9, Uran. et phal., v. 1, p. 208). Cramer (Bull. Brooklyn entom. soc., Aug. 1883, v. 6, p. 48) briefly describes the eggs of this species, of which about five hundred were deposited 3 June. Bowles (Can. entom., April 1871, v. 3, p. 11-12) (Ann. rept. Entom. soc. Ontario, 1871, p. 38-39) describes a variety of the larva which fed on "black currant" [*Ribes nigrum*], and Goodell (*op. cit.*, April 1878, v. 10, p. 67) describes another variety which fed on apple and pear. Lintner (Entom. contrib., no. 3, 1874, p. 166) briefly describes the larva, giving *Acer* as food-plant, and Packard (Guide study ins., 1869, p. 322) gives a few notes on the larva, which he states feeds upon *Ribes aureum*, *R. ♀grossularia*, and *Spiraea tomentosa*. Pilate (Papilio, May 1882, v. 2, p. 71) gives "honey-locust" (*Gleditsia triacanthos*) as food-plant. Lintner (Entom. contrib. [no. 1], 1869, p. 64) gives plum as food-plant. To the above food-plants may be added *Betula alba*, *B. lenta*, *Castanea vesca*, *Salix*, and *Spiraea sorbifolia*. The larva varies from pea-green to brownish grey or even brownish black in general color: as far as noticed the green form is from *Ribes*, *Salix* and *Spiraea*, while those from apple exhibit all the color variations; on *Betula* and *Castanea* the larvae are grey. Similar variations have been noticed in the larvae of *Amphidasys betularia*, a European species. The larvae often rest in a partially twisted position, with their rigid bodies at a considerable angle from the stem to which they cling, thus imitating very closely twigs and petioles. The larvae are common in New England in July and August:

they pupate from the latter part of July to September, the pupa hibernating under leaves and rubbish.

Cymatophora crepuscularia Treits (Schmett. v. Europa, 1827, v. 6, pt. 1, p. 190). Goodell (Can. entom., Apr. 1878, v. 10, p. 67) has described the larva of this species from a single specimen taken on plum, 30 May; pupation took place 6 June, and the imago emerged 19 June. In Europe this very variable larva has often been reared. Herr (Anleitung d. schmett. u. raupen... 1833, pt. 2, p. 272) gives a good description of the larva, and states that its food-plants are *Aquilegia*, *Salix*, *Populus*, *Alnus*, *Ulmus*, *Spartium*, and *Sambucus*. Kaltenbach (Pflanzenfeinde, 1872, p. 614-615) writes "A very common geometrid whose larva is very differently marked according to its food-plant. On *Salix* Borkhausen found it brownish-green, on Italian poplar grey-green, on *Alnus* brownish-grey, on *Ulmus* lighter green than on *Salix*, on *Sambucus* grey-brown, etc. Treitschke's specimens reared on plum were yellowish. Pupation takes place under the ground; the moth appears in two generations, in spring from hibernated pupae and again in July. The larvae appear in June and in September." Kaltenbach (*op. cit.*, p. 110, 234, 302, and 435) adds the following to previously mentioned food-plants: *Betula alba*, *Genista*, *Quercus*, *Rubus*, *Lonicera*, and *Ligustrum*. The larva of this species is common on *Betula alba* in eastern Massachusetts, where it is found ready for pupation as early as the middle of June. Of three larvae taken 12 Aug. 1882, one pupated 29 Aug. and hibernated as pupa, developing an

imago the next spring; another pupated 2 Sept. and died later, and the third pupated 2 Sept. and the imago appeared 28 Sept. of the same year. Two annual broods of larvae are therefore probable in New England, as in Germany, but part of the second brood apparently emerge and oviposit in late autumn, while the rest hibernate as pupae.

Paraphia subatomaria Guenée (Hist. nat. d. ins., 1857, v. 9, Uran. et Phal., v. 1, p. 272). A larva taken on *Betula alba*, at Belmont, Mass., 12 Aug. 1882, pupated 19 Sept. and a male imago emerged 8 Oct. 1882. This larva was mistaken for a young larva of *Cymatophora crepuscularia*. Another larva, taken on the same species of plant, at Cambridge, Mass., 10 Sept. 1882, pupated 27 Sept. and produced a female imago 28 Oct. 1882. A third larva taken in Cambridge, on the same plant in the fall of 1883, pupated, and would have hibernated as pupa had it not been kept in a warm room; the moth emerged during the winter. Packard (Mon. geom. moths U. S., 1876, p. 418) writes "The moth has been raised by Mr. W. Saunders, of London, Canada, from a 'brown geometric larva on the pine, the imago appearing June 24th'."

Ephyra pendulinaria Guenée (Hist. nat. d. ins., 1857, v. 9, Uran. et phal., v. 1, p. 414). Packard (Mon. geom. moths U. S., 1876, p. 363-364) gives a description, by S. H. Scudder, of the larva and pupa of this species; the larva fed on *Comptonia asplenifolia*. A larva of this species, taken on *Betula alba*, at Wachusett, Mass., 26 Aug. 1882, pupated 28 Aug., and the imago appeared 14 May 1883.

Anagoga pulveraria Linn. (Syst. nat., 1758, ed. 10, p. 521). Herr (Anleitung d. raupen d. deutsch. schmett., 1833, p. 284) describes larva and pupa, and gives *Salix caprea* as food-plant of this species. Kaltenbach (Pflanzenfeinde, 1872, p. 571 and 598) gives *Salix* and *Betula* as food-plants. Packard (Mon. geom. moths, 1876, p. 488-489) quotes Merryfield's description of the larva, and states, on authority of Goodell, that the larva is found on *Corylus*.

Endropia armataria Herrich-Schaeffer (Samml. neuer od. wenig bekannter ausser-eur. schmett., 1850-1858, pl. 65, fig. 373-374). Saunders (Can. entom., Oct. 1871, v. 3, p. 130-131) (Ann. rept. Entom. soc. Ontario, 1871, p. 38) describes the larva of this species which he found on species of *Ribes*. A female of this species taken 15 June 1883, in Cambridge, Mass., was confined over fresh twigs of *Acer*, *Ribes rubrum* and *R. aurcum*. On 18 June she laid two rows of elongated, flattened eggs upon a leaf of *Acer*; their color was light green, but by 20 June they had become shining carmin-red, which later became dull-red. The eggs were 0.7 mm. long, 0.5 mm. wide and 0.4 mm. high, and were placed closely side by side in rows, and gummed to the leaf. They hatched 27 June. The larvae would not readily eat leaves of *Ribes*, but ate, in order of preference, leaves of *Betula alba*, of *Acer*, and of apple. One pupated 2 Aug. 1883 and the imago appeared 19 Aug. 1883; the second pupation occurred 6 Aug. 1883, but the imago did not appear until 3 June 1884; two more pupated 17 Aug. 1883, both of which produced imagos about 7 June 1884. In this case, of the four larvae which succeeded in producing imagos, all were subjected as nearly as possible to equal conditions, being reared in the same jar, upon the same plants, which were kept fresh with their stems in water, yet one of the imagos appeared the same fall, only seventeen days after pupation, while the three others remained about ten months in the pupal state. Those reared by Mr. Saunders hibernated as pupae.

Eugonia alniaria Linn. (Syst. nat., 1758, ed. 10, p. 519) [= *E. magnaria* Guenée]. The eggs of this species are flattened, oblong, 1.1 mm. long, 0.6 mm. wide, and 0.5 mm. high. They are of a greenish-brown, somewhat polished bronze color, and when laid upon a smooth surface are arranged side by side in a curve having the length of the abdomen of the female moth for its radius. When laid upon bark and rough surfaces the eggs are in

broken, short rows. A single female deposits five hundred to six hundred eggs. Oviposition takes place in September and October, and the eggs hatch in May and June, hibernation taking place in the egg state, as is the case with some other species of *geometridæ*. Hellins (Entom. mo. mag., Mar. 1870, v. 6, p. 222) gives similar dates for oviposition and hatching in England. The larva and pupa are described by Herr (Anleitung d. raupen, d. deutschen schmett., 1833, p. 258) who enumerates the following food-plants: *Betula*, *Alnus*, *Corylus avellana*, *Carpinus betulus*, *Ulmus*, apple, pear, stone-fruit, and *Tilia*. Herold (Teutscher raupenkalender, 1845, p. 135) gives *Fagus* in addition to the above-mentioned trees. Harris (Entom. corresp., 1869, p. 320) gives notes on different stages of this species. Kaltenbach (Pflanzenfeinde, 1872, p. 89, 218, and 552) adds *Acer*, *Rosa* and *Populus* as food-plants. Lintner (Entom. contrib., no. 3, 1874, p. 165), in a note on *Eugonia magnaria*, gives *Syringa vulgaris* as food-plant. Packard (Mon. geom. moths, 1876, p. 530) quotes descriptions of larva and pupa by Goodell and by Scudder; the former entomologist gives *Castanea vesca*, and the latter *Betula lenta* as food-plant. Rouast (Annales Soc. linn. de Lyon, ann. 1882, [1883], v. 29, p. 340) adds *Quercus robur* to the food-plants. Packard (Bull. no. 7, U. S. entom. comm., 1881, p. 92) repeats Goodell's description of the larva and pupa, adds one of the moth, and further remarks that Scudder's description "is so different from Mr. Goodell's that I fear it refers to a different insect." This is not, however, the case, but the larva is very variable in coloration. Worthington (Can. entom., Jan. 1878, v. 10, p. 16) writes, "This larva evidently changes its color somewhat with different food, as these [larvae] closely resemble the bark of this tree [maple]." The general coloration may vary to match that of the bark of the tree on which the larvae feed, but the head, which is the part of the larva that varies most, is slate-grey, green, or dull red in specimens taken

from maple. These larvae, having molted at least four (probably five) times, pupate from the latter part of July to the end of September; the pupal state lasts from eighteen to twenty days, the imago flying from the middle of September until the last of October in New England. The larvae are not rare upon *Betula alba* and *B. lutea*.

Catocala relicta Walk. (List lep. ins. Brit. mus., 1857, pt. 13, p. 1192-1193.) Bunker (Can. entom., May 1883, v. 15, p. 100) states that *Populus* is the favorite food-plant of the larva of this species. Hulst (Bull. Brooklyn entom. soc., July 1884, v. 7, p. 48) says "Food-plant, white birch and silver poplar; and probably all species of *Betula* and *Populus*." The same author (*l. c.*, June 1884, v. 7, p. 15-16) gives structural characters and habits of the larvae of *Catocala*. The European *C. fraxini*, regarded by some authors to be a synonym of *C. relicta*, feeds, as larva, on *Populus*, *Betula*, *Acer*, *Ulmus*, *Quercus*, and *Fraxinus*. *C. relicta* has been reared by G: Dimmock, in Springfield, Mass., from a full-grown larva taken under circumstances which made it almost certain that its food-plant was *Acer*.

Brepfos infans Möschler (Wien. entom. monatsschr., Mar. 1862, v. 6, p. 134-136, pl. 1, fig. 6). Harris (Entom. corresp., 1869, pl. 1, fig. 4) figures the imago of this species. Lintner (Entom. contrib., no. 4, 1878, p. 227-229) gives notes upon the habits of the imago which render it almost certain that the larva feeds upon *Betula*. The larvae of the European species of this genus feed upon *Betula alba*, the larva of *Brepfos parthenias* living between leaves that it spins together upon high twigs. The imagos of *B. infans* are not rare about *Betula alba*, extremely early in the spring, both in eastern and western Massachusetts.

Orthosia instabilis Fabr. (Entom. syst., 1793, v. 3, p. 119) [= *Taeniocampa incerta* Hübn.]. Kaltenbach (Pflanzenfeinde, 1872, p. 429-430, 550, 640) gives the following food-plants for the larva of this species in Europe:

Apple, *Ulmus*, *Tilia*, *Salix*, *Quercus*, *Fraxinus*, *Betula alba*, *Populus* and *Carpinus*; to this list Roüast (Annales Soc. linn. Lyon, ann. 1882, [1883], n. s., v. 29, p. 315-316) adds *Amygdalus communis*, *Crataegus oxyacantha*, and *Centaurea jacea*.

Apatela xyliniformis Guen. (Hist. nat. d. ins., 1852, v. 5, Noct., v. 1, p. 56). Thaxter (Papilio, Jan. 1883, v. 3, p. 17) states that the larva of this species feeds on *Betula* and blackberry [*Rubus*].

Apatela brumosa Guen. (Hist. nat. d. ins., 1852, v. 5, Noct., v. 1, p. 52). Thaxter (Papilio, Jan. 1883, v. 3, p. 17) states that the larva of this species feeds on *Betula*, *Salix*, and *Populus*.

Apatela dactylina Grote (Proc. Bost. soc. nat. hist., April 1874, v. 16, p. 239). Thaxter (Psyche, May-June [9 July] 1877, v. 2, p. 35) gives *Betula* and *Salix* as food-plants of the larva of this species.

Apatela americana Harr. (Rept. ins. injur. veg., 1841, p. 317). Harris (*op. cit.*, p. 317-318) describes the larva and cocoon of this species: he writes, "The caterpillar eats the leaves of the various kinds of maple and sometimes also those of the elm and chestnut." The same author (Treatise on ins. injur. veg., 1862, p. 436-437) figures larva, pupa, and imago of this species and adds *Tilia* to the food-plants; and (Entom. corresp., 1869, p. 311) again describes the larva. In Amer. entom., April 1869, v. 1, p. 166, this species is stated to feed on *Populus dilatata* and *P. monilifera*, and Riley (2nd rept. state entom. Mo., 1870, p. 121) gives *Betula* and *Alnus* as food-plants. Coquillett (Papilio, Jan. 1881, v. 1, p. 6) describes the larva, and gives red oak (*Quercus*) as food-plant. Thaxter (Papilio, Jan. 1883, v. 3, p. 17) adds *Fuglans*, *Fraxinus* and *Platanus* to the recorded food-plants.

Apatela vulpina Grote (Can. entom., Jan. 1883, v. 15, p. 8-9). Thaxter (Papilio, Jan. 1883, v. 3, p. 14-15) describes the larva of this species, and gives *Populus* and *Betula* as food-plants.

Apatela spinigera Guen. (Hist. nat. d. ins., 1852, v. 5, Noct., v. 1, p. 45). Thaxter (Psyche, March-April [24 Sept.] 1878, v. 2, p. 121-122) describes the larva of this species and gives as food-plants *Rubus* and *Betula*.

Apatela occidentalis Grote and Rob. (Proc. Entom. soc. Phil., May 1866, v. 6, p. 16). The larva of this species is described by Harris (Entom. corresp., 1869, p. 311-312), who found it feeding on plum, cherry, and *Pyrus americana*. Lintner (Entom. contrib. [no. 1], 1869, p. 62) adds apple to the food-plants. Saunders (Can. entom., March 1872, v. 4, p. 50) describes the larva. Packard (Papilio, Nov.-Dec. 1882, v. 2, p. 181) briefly describes the larva and pupa. Thaxter (Psyche, May-June [9 July] 1877, v. 2, p. 35) gives *Ulmus* as food-plant. A specimen taken on *Betula lutea*, at Wachusett, Mass., 26 Aug. 1882, pupated 30 Aug., and the imago appeared 12 June 1883. This larva, which also ate *Betula alba*, did not entirely agree in coloration with Saunders' description.

Charadra propinquinella Grote (Trans. Amer. entom. soc., Jan. 1873, v. 4, p. 293-294). Goodell (Papilio, Feb. 1881, v. 1, p. 15) describes the larva of this species and gives "white birch" as food-plant. Thaxter (Papilio, Jan. 1883, v. 3, p. 11-12) gives notes on the larva, which feeds on *Betula*, *Fuglans*, *Acer* and *Quercus*.

Charadra deridens Guen. (Hist. nat. d. ins., 1852, v. 5, Noct., v. 1, p. 35-36). Saunders (Can. entom., Sept.-Oct. 1870, v. 2, p. 145-146) describes the larva, and Lintner (Entom. contrib., no. 3, 1874, p. 157) figures and describes it. Thaxter (Papilio, Jan. 1883, v. 3, p. 11-12) describes the egg, the seven larval stages, and the cocoon; the larva feeds upon red oak (*Quercus*), *Betula* and *Ulmus*.

Cossus sp. Lintner (Entom. contrib., no. 4, 1878, p. 244-245) states that the larva of a *Cossus*, the pupal cases of which prove to be those of some as yet undescribed species, bore in the wood of *Betula populifolia*.

Gastropacha americana Harris (Rept. ins. injur. veg., 1841, p. 273-274). This author

(*L. c.*, and Treatise on ins. injur. veg., 1862, p. 377-378) briefly describes the larva, which he states feeds upon apple, and, on authority of Abbot, upon *Quercus* and *Fraxinus*. Lintner (Entom. contrib. [no. 1], 1869, p. 193), in a note upon the larva, gives *Betula* as food-plant, and later (Entom. contrib., no. 3, 1874, p. 154-155) describes the larva, which he states to feed on *Betula lenta* and *Acer*. Lyman (Can. entom., Aug. 1874, v. 6, p. 158) describes the eggs of this species.

Clisiocampa silvatica Harris (Rept. ins. injur. veg., 1841, p. 271-272) [= *C. distria* Hübn.]. Harris (*op. cit.*, p. 272) describes the larva of this species, giving as food-plants, *Quercus*, *Fuglans* and apple; later (Treatise on ins. injur. veg., 1862, p. 375-376, pl. 7, fig. 18-19) he repeats the description, and adds a colored figure of the larva and imago, adding wild cherry to the food-plants; again he describes (Entom. corresp., 1869, p. 292) the larva. Morris (Synop. lepid. N. A., 1862, p. 326) quotes Harris's descriptions (1841) of the larva and imago. Riley (Amer. entom., July-Aug. 1870, v. 2, p. 261-265, and 3rd rept. state entom. Mo., 1871, p. 121-127) describes eggs and egg-mass, larva and imago, giving, in addition to the food-plants mentioned above, *Fraxinus*, *Tilia*, *Rosa*, *Carya*, plum, and peach. Saunders (Can. entom., July 1872, v. 4, p. 134) repeats Riley's figures, and (*op. cit.*, Aug. 1877, v. 9, p. 159) gives another figure of the larva, adding *Acer*, *Crataegus* and *Fagus* to the food-plants; later Saunders (*op. cit.*, Feb. 1878, v. 10, p. 21-23) gives notes on the eggs of this species and of *C. americana*, and on the destruction of these eggs by mites. Packard (Bull. 7, U. S. entom. comm., 1881, p. 40-41) figures egg, larva, and imago, and describes the larva and the male and female imagos. The larva of this species eats leaves of *Betula alba*.

Anisota senatoria Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 113, pl. 57). Harris (Rept. ins. injur. veg., 1841, p. 291-

292) describes the larva, pupa, and imago of this species; the larva, he states, feeds upon white and red oaks [*Quercus* sp.]. Morris (Synop. lepid. N. A., 1862, p. 231) describes the larva and imago. Harris (Treatise on ins. injur. veg., 1862, p. 405-406) figures and describes larva, pupa, and imago, and (Entom. corresp., 1869, p. 298, pl. 2, fig. 9, and pl. 4, fig. 12) gives a colored figure of the larva and a black one of the pupa. Riley [?] (Amer. entom., Sept.-Oct., 1869, v. 2, p. 26) states that the larva eats raspberry [*Rubus* sp.]. Lintner (Entom. contrib., no. 2, 1872, p. 51-52) describes the early stages of the larva, which, he writes, has four molts (five stages), and feeds on *Quercus prinoides*. Packard (Bull. 7, U. S. entom. comm., 1881, p. 45) briefly describes the larva, and gives a few notes upon its habits. The larva feeds on *Betula alba*.

Hyperchiria io Fabr. (Syst. entom., 1775, p. 560). Harris (Rept. ins. injur. veg., 1841, p. 283-285) describes the larva and male and female imagos; later (Treatise on ins. injur. veg., 1862, p. 393-396) he adds to the descriptions figures of the larva, pupa, cocoon, and male and female imagos; and still later (Entom. corresp., 1869, p. 295-297) he gives a more extended description of the larva. Morris (Synop. lepid. N. A., 1862, p. 220) briefly describes the larva. Packard (Guide study ins., 1869, p. 299) gives brief notes on this species, under the name of *Hyperchiria varia* Walker. Bethune (Can. entom., Oct. 1869, v. 2, p. 19-20) briefly describes the larva, and Minot (*op. cit.*, Nov. 1869, v. 2, p. 28-29) describes egg and larva without recognizing the species. Lintner (Entom. contrib., no. 2, 1872, p. 146-149) describes the egg, the six larval stages, the pupa, and the cocoon. Riley (5th rept. state entom. Mo., 1873, p. 133) describes egg, larva in its six stages, cocoon, and imago of this species, figuring larva and male and female imagos; and (Can. entom., June 1873, v. 5, p. 109) describes the egg in detail. Reed (Can. entom., Dec. 1874,

v. 6, p. 227-229, and Ann. rept. Entom. soc. Ontario, 1874, p. 11-13) repeats Riley's figures, and describes the different stages very briefly. Grote (Can. entom., Sept. 1878, v. 10, p. 176) states that this species is double-brooded in the south. The food-plants, as compiled, in chronological order, from the above and from other notices of this species are as follows: *Populus balsamifera*, *Ulmus*, *Trifolium*, *Zea mays*, and, according to Abbot, *Cornus* and *Sassafras* [Harris, 1841]; *Quercus* and *Robinia viscosa* [Harris, 1869]; *Cornus florida* and *Liriodendron* [Morris]; *Humulus* [Freeman (Amer. entom., Oct. 1868, v. 1, p. 39)]; *Gossypium* and *Acer* [Packard]; *Salix* [Bethune]; *Populus tremuloides*, *Robinia pseudacacia*, and *Cerasus virginiana* [Lintner]; *Amorpha fruticosa*, *Baptisia*, *Prunus serotina*, and currant [Riley]; *Corylus avellana* [Reed]; *Betula*, *Comptonia asplenifolia*, apple, *Lespedeza*, *Symphoricarpos*, and *Fraxinus* [Goodell (Can. entom., Sept. 1877, v. 9, p. 180)]; *Prinos verticillatus*, *Rubus villosus* and *R. canadensis* [Goodell (*op. cit.*, Apr. 1879, v. 11, p. 78)]; and *Trifolium pratense* [Pilate (Papilio, May 1882, v. 2, p. 67)]. The larva also eats *Betula alba*.

Attacus cecropia Linn. (Syst. nat., 1758, ed. 10, p. 809). Harris (Rept. ins. injur. veg., 1841, p. 279-280) describes the larva, imago and cocoon of this species; later (Treatise on ins. injur. veg., 1862, p. 385, 387-389) he adds figures of the larva, pupa, cocoon, and male imago; and still later (Entom. corresp., 1869, p. 294-295) he again describes the larva. Morris (Synop. lepid. N. A., 1862, p. 223-224) describes larva, cocoon, and imago. Trouvelot (Amer. nat., March 1867, v. 1, p. 31) gives a note on the cocoon. Riley (Amer. entom., Feb. 1870, v. 2, p. 97-102, and 4th ann. rept. state entom. Mo., 1872, p. 103-107) describes the eggs, and figures and describes the larva, pupa, cocoon, and male imago. Sprague (Can. entom., April 1870, v. 2, p. 82) describes the eggs. Saunders (Can. entom.,

Oct. 1871, v. 3, p. 149-155) figures and describes the larva, cocoon, and male imago. Lintner (Entom. contrib., no. 3, 1874, p. 125) describes the young larva. Worthington (Can. entom., Sept. 1876, v. 8, p. 165-166) notices some color-varieties of the imago. Gentry (Can. entom., March 1877, v. 9, p. 41-49) describes the egg, different stages of the larva, and cocoon. Grote (Can. entom., Sept. 1878, v. 10, p. 176) says this species is double-brooded in the southern United States. Packard (Bull. 7, U. S. entom. comm., 1881, p. 113) figures the larva. Neumoegen (Papilio, Jan. 1882, v. 2, p. 18) states that this species usually emerges from the pupal state at about 5 p.m.; Brodie (*op. cit.*, May 1882, v. 2, p. 83), on the contrary, states that the emergence normally takes place about 10 a.m. Riley and others state that the larva has five stages, but Wailly (Bull. Soc. acclim. France, May 1882, s. 3, v. 9, p. 266-267) writes that it has six stages. Brodie (Papilio, Feb. 1882, v. 2, p. 32-33) gives a list of 49 species of plants belonging to 20 genera on which the larva will feed: the genera are *Filia*, *Acer*, *Negundo*, *Prunus*, *Spiraea*, *Crataegus*, *Pyrus*, *Amelanchier*, *Ribes*, *Sambucus*, *Ulmus*, *Quercus*, *Fagus*, *Corylus*, *Carpinus*, *Betula*, *Alnus*, *Salix*, and *Populus*. From other authors the following genera are compiled: *Berberis*, *Liriodendron*, *Syringa*, *Carya*, *Gleditschia*, *Rubus*, *Ceanothus*, *Ampelopsis*, *Cephalanthus*, *Fraxinus*, *Vaccinium*, and *Rosa*.

Attacus promethca Drury (Illus. nat. hist. . . 1770, v. 2, pl. 11-12). Harris (Rept. ins. injur. veg., 1841, p. 280-281) describes larva, cocoon, and imago of this species, giving *Sassafras*, wild-cherry, *Azalea*, and *Cephalanthus* as food-plants; later (Treatise ins. injur. veg., 1862, p. 390-391) he repeats these descriptions, adding figures of the male and female imagos. Morris (Synop. lepid. N. A., 1862, p. 224-225) describes larva, cocoon, and imago, and adds *Laurus benzoin* to the food-plants. Trouvelot (Amer. nat., Mar. 1867,

v. 1, p. 31) gives a note on the cocoon, and adds *Syringa* to the food-plants. Minot (Can. entom., May 1870, v. 2, p. 100) compiles a list of the food-plants of the larva, adding to those mentioned above, *Berberis*, *Betula*, *Acer*, *Quercus*, sometimes *Thuja*, and *Pinus*, *Fagus*, apple, peach, plum, silver-bell [*Halesia*]. Riley (4th ann. rept. state entom. Mo., 1872, p. 121-123) describes the egg, five larval stages, and the cocoon, and figures larva, cocoon, and male and female imagos; he adds *Liriodendron* to the food-plants. Lintner (Entom. contrib., no. 3, 1874, p. 126) describes egg and young larva. W. H. Edwards (Psyche, Jan. [27 June] 1881, v. 3, p. 161, 171-174) discusses the variability in the number of molts of *A. prometha*, showing that it molts, in West Virginia, only three times, thus having four stages. Brodie (Papilio, May 1882, v. 2, p. 83) gives a note on time of emergence, copulation, and oviposition of this species. Saunders (Can. entom., Dec. 1883, v. 15, p. 231-233) uses Riley's figures of larva, cocoon, and male and female imagos, and adds *Populus* to the food-plants of the larva.

At. cus polyphemus Fabr. (Species insector., 1781, v. 2, p. 168). Among the very numerous articles which have been published concerning this species the following are worthy of citation. Harris (Rept. ins. injur. veg., 1841, p. 278-279) describes larva, cocoon and imago; later (Treatise on ins. injur. veg., 1862, p. 384-386) he adds a figure of the imago, and (Entom. corresp., 1869, p. 294, pl. 4, fig. 17) a figure of the larva. Morris (Synop. lepid. N. A., 1862, p. 226-227) describes larva and imago, and (*op. cit.*, p. 209) describes the egg, which he mistook for that of *Smerinthus excacatus*. Trouvelot (Amer. nat., 1867, v. 1, p. 30-38, 85-94, 145-149, pl. 5-6) gives an extended account of this species which he tried to rear, on a considerable scale, for its silk; he describes the egg, larva, pupa, and cocoon, and figures the larva, pupa, cocoon, and male and female imagos, as well as *Ophion macrurum*, a parasite of the larva;

he says there are at least six varieties of the imagos. Packard (Guide study ins., 1869, p. 297, pl. 6-7) repeats Trouvelot's figures. Riley [?] (Amer. entom., March 1869, v. 1, p. 121-122) figures the imago and describes the larva and imago. Riley (4th ann. rept. state entom. Mo., 1872, p. 125-129) describes egg, larva, cocoon, pupa, and imago, and figures larva, pupa, cocoon, and male and female imagos; contrary to Trouvelot, who stated that there are six larval stages, Riley gives the number of molts as four, making five larval stages. Lintner (Entom. contrib. [no. 1], 1872, p. 6) gives a note on the coloration of the eggs, and (*op. cit.*, no. 3, 1874, p. 152) describes the egg. Gentry (Can. entom., May 1874, v. 6, p. 86) describes the normal form and a variety of the larva. Grote (Can. entom., Sept. 1878, v. 10, p. 176) states that this species is double-brooded in the south; Trouvelot (*l. c.*) was unable to raise two broods to maturity in Massachusetts, and Brodie (Papilio, April 1882, v. 2, p. 60) writes that, "in long and warm seasons about 50 per cent. are double brooded, but this is against the increase of the species, as cold weather usually sets in before the larvae are fully matured." Packard (Bull. 7, U. S. entom. comm., 1881, p. 48) figures the larva. Saunders (Can. entom., March 1882, v. 14, p. 41-45) figures and describes the larva, pupa, cocoon, and male and female imagos; he further figures *Ophion macrurum*, a parasite of the larva. Brodie (Papilio, May 1882, v. 2, p. 83) states that normally this insect comes from its cocoon at about 11 a.m. Wailly (Bull. Soc. acclim. France, May 1882, s. 3, v. 9, p. 265) gives some notes upon the larva and imago. A compilation of the food-plants results as follows: *Quercus*, *Ulmus*, *Tilia* [Harris, 1841 and 1862]; *Tilia americana* and *Rosa* [Harris, 1869]; *Acer*, *Salix*, *Populus*, *Corylus*, *Betula*, *Vaccinium* [Trouvelot]; *Carya*, *Juglans nigra*, *F. cinerea*, *Crataegus* (Amer. entom., 1869, v. 1, p. 121); *Quercus virens*, [Chambers (Amer. entom., March 1870, v. 2, p. 156)]; apple, quince,

plum, *Prunus virginiana*, *Platanus*, *Gleditschia* [Riley]: *Betula lenta* [Young (Can. entom., Oct. 1880, v. 12, p. 212)]; *Hamelis virginica* [Kyle (*op. cit.*, p. 213)]; *Castanea vesca*, *Fagus* [Wailly (Journ. Soc. arts. 31 March 1882, v. 30, p. 528)]; *Tilia europæa*, *Crataegus coccinea*, *C. tomentosa*, *C. crux-galli*, *Amelanchier canadensis*, *Ribes cynosbati*, *Quercus alba*, *Q. macrocarpa*, *Q. rubra*, *Corylus americana*, *C. rostrata*, *Fagus ferruginea*, *Carpinus americana*, *Ostrya virginica*, *Carya tomentosa*, *C. amara*, *C. alba*, *Betula lenta*, *B. excelsa*, *B. alba*, *B. papyracea*, *Alnus incana*, *A. serrulata*, *Salix alba*, *S. humilis*, *Populus grandidentata*, *P. tremuloides* [Brodie (Papilio, April 1882, v. 2, p. 58-59)]. Chestnut, as a food-plant, is only mentioned by Wailly, who reared the larvae in England, but they are often found, in eastern Massachusetts, on *Castanea vesca*.

Attacus luna Linn. (Syst. nat., 1758, *ed. 10*, p. 210). Harris (Rept. ins. injur. veg., 1841, p. 277-278) describes larva, cocoon, and imago, and gives *Juglans* and *Carya* as food-plants; he repeats (Treatise on ins. injur. veg., 1862, p. 382-384) these descriptions, adding a figure of the cocoon and imago; later (Entom. corresp., 1869, p. 293-294, pl. 4, fig. 14) he describes and figures the larva, specifying the food-plants as *Carya porcina* and *Juglans cinerea*. Morris (Synop. lepid. N. A., 1862, p. 225-226) describes the larva and imago. Trouvelot (Amer. nat., Mar. 1867, v. 1, p. 31) gives a note on the cocoon, and adds *Quercus* and *Platanus* to the food-plants. Minot (Can. entom., Nov. 1869, v. 2, p. 27) describes the egg. Riley (4th ann. rept. state entom. Mo., 1872, p. 123-125) describes the egg and larva, which he states to have five stages, and figures larva, cocoon, and imago; among food-plants he mentions *Liquidambar*, *Fagus*, *Betula*, *Salix*, and plum. Lintner (Entom. contrib., no. 3, 1874, p. 126-128) describes the larva, which molts four times. Gentry (Can. entom., May 1874, v. 6, p. 86) describes the normal form of the larva, and a variety of it. Bunker (Can.

entom., April 1875, v. 7, p. 63) mentions how to distinguish the cocoon of this species from that of *A. polyphemus*. Rogers (Can. entom. 1875, v. 7: Aug. p. 141-143; Oct., p. 199-200) describes egg, larva, cocoon, and imago. Thaxter, Psyche, Sept. [10 Nov.] 1876, v. 1, p. 194) adds *Ostrya virginica* and *Castanea* to the food-plants of the larva. Saunders (Can. entom., Feb. 1877, v. 9, p. 32-33) figures and describes the imago. Grote (Can. entom., Sept. 1878, v. 10, p. 176) states that this species is double-brooded in the southern United States.

Drepana sp. A pupa taken 5 July 1883, at Cambridge, Mass., upon *Betula alba*, upon which the larva had evidently fed, gave as imago, 16 July 1883, a species of *Drepana*.

Platypteryx bilineata Packard (Proc. Entom. soc. Phil., Nov. 1864, v. 3, p. 359). Packard (*l.c.*) writes "Dr. Harris has reared this from the larva, which pupated July 25; imago Aug. 15." Harris (Entom. corresp., 1869, p. 142) gives a crude figure of the larva of some American species of *Platypteryx*?, and Packard Guide study ins., 1869, p. 293 repeats this figure as that of a species of *Dryopteris*; no food-plant is mentioned by either author. The European species, *Platypteryx lacertula*, feeds on birch. The larva of *P. bilineata* is found upon *Betula alba*, in eastern Massachusetts, about the first of July and again early in September; hibernation takes place as pupa in the September brood. Dr. G.: Dinmock will later describe the egg, larva and pupa of this insect in detail, but the following notes will suffice for the recognition of the larva and pupa. The full-grown larva is about 12 mm. long, tapering from the anterior to the posterior end, which latter terminates in a single point, turned upward, in place of the anal legs. The dorsal surface of each segment bears four tubercles, each supporting a single short hair. The arrangement of these tubercles is peculiar: segment 1 has small tubercles arranged thus . . . ; segments 2 and 3 each have large tubercles arranged . . . (the head in each case sup-

posed to be upward); segments 4-10 each have small tubercles arranged . . . ; segments 11-12 each have two large and two small tubercles arranged The slight cocoon is made between leaves of the birch which the larva has drawn together for the purpose, and the pupa within it is densely covered with a white bloom.

Coelodasys unicornis Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 165, pl. 86). Harris (Rept. ins. injur. veg., 1841, p. 306-307) describes the larva of this species and gives as food-plants plum and apple, and adds to them, on authority of Abbot, *Prinos verticillatus*. Harris (Entom. corresp., 1869, pl. 2, fig. 8) gives a colored figure of the larva. Payne (Amer. entom., Oct. 1870, v. 2, p. 341) notes that the larva mimics partly dead and partly living margins of leaves. Lintner (Entom. contrib., no. 3, 1874, p. 131) describes and figures the larva, adding *Corylus americana* and *Prunus virginiana* to the previously known food-plants; his figure is copied in Amer. nat., Nov. 1874, v. 8, p. 691-692. Packard (Bull. 7, U. S. entom. comm., 1881, p. 136) adds *Crataegus* to the food-plants. The larva also feeds on *Betula alba*.

Notodonta coucinea Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 169, pl. 85). Harris (Rept. ins. injur. veg., 1841, p. 307-309) describes larva and imago of this species, and gives as food-plants apple, cherry, plum, *Rosa* and *Crataegus*; this description is quoted by Morris (Synop. lepid. N. A., 1862, p. 242), and is repeated with figures of larva and imago (Treatise on ins. injur. veg., 1862, p. 425-426, pl. 6, fig. 11) and with a colored figure of the larva by Harris (Entom. corresp., 1869, p. 303, pl. 1, fig. 3). Riley (Amer. entom., Sept.-Oct., 1869, v. 2, p. 27) figures larva, pupa, and imago, and adds pear to the food-plants; Riley's figures are repeated by Saunders (Can. entom., July 1881, v. 13, p. 138-140). The larva also eats *Betula alba*.

Notodonta dictava Linn. (Syst. nat., 1767, ed. 12, p. 826) [= *Pheosia rimosa* Packard

(Proc. Entom. soc. Phil., Nov. 1864, v. 3, p. 358)]. Lintner (Entom. contrib., no. 4, 1878, p. 188-193) gives descriptions of the larvae and other notes on this species, for which, on authority of Stephens, he gives the food-plants *Populus*, *Salix*, and *Betula*.

Datana ministra Drury (Illust. nat. hist. 1773, v. 2, p. 25, pl. 14, fig. 3). Harris (Rept. ins. injur. veg., 1841, p. 311-312) describes the larva and imago, and this description is repeated, with the addition of a wood-cut of the larva and a colored figure of the imago, in his Treatise on ins. injur. veg., in 1862; he gives (Entom. corresp., 1869, p. 308-310, pl. 2, fig. 4) a description with colored figure of the larva. Grote and Robinson (Proc. Entom. soc. Phil., 1866, v. 6, p. 11-12) describe the imago and the larva with especial reference to distinguishing it from the larvae of other species of *Datana*. Harris (*l.c.*) gave as food-plants of the larvae, apple and cherry; Riley (Amer. entom., July-Aug., 1870, v. 2, p. 263) adds *Juglans nigra*; and Southwick and Beutenmüller (Science record, 15 April 1884, v. 2, p. 133), in a list of the food plants of larvae of species of *Datana*, add, for *D. ministra*, *Quercus*, *Corylus*, *Carya*, *Crataegus*, *Robinia*, *Betula*, *Tilia*, *Castanea*, and *Fagus*. The eggs of this species, which are often found in groups beneath the leaves of *Betula alba*, are, at least in eastern Massachusetts, very often nearly all destroyed by a minute hymenopterous parasite.

Limacodes scapha Harr. (Rept. ins. injur. veg., 1841, p. 303). Harris (*l.c.*, and Treatise on ins. injur. veg., 1862, p. 420) describes the species as larva, which he states to live on *Juglans*; later (Entom. corresp., 1869, p. 300, pl. 3, fig. 8) he figures the larva, and adds apple to the food-plants. Walsh (Proc. Bost. soc. nat. hist., Feb. 1864, v. 9, p. 298-299) first describes the imago and says, "The larva fed on hickory leaves, but I have met with two specimens on the button-wood or sycamore." Packard (Guide study ins., 1869, p. 290 and Bull. 7, U. S. entom. comm., 1881,

p. 77) briefly describes the larva, cocoon and imago, figuring the last. A single larva of this species, taken on *Betula alba* at Belmont, Mass. 12 Aug. 1882, pupated 17 Sept., and emerged 1 July 1883. The excrement of the larva has a peculiar form, being cup-shaped, with a deep concavity, and comparatively thin walls which are somewhat shrivelled about the margin in drying. The larva, when disturbed, exhales an odor difficult to describe. A short time before pupation it turns whitish.

Phobetron pithecium Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 147, pl. 74). Harris (Rept. ins. injur. veg., 1841, p. 304-305) describes the larva and imago of this species, stating that the larva feeds on oak, and, according to Melshemer, on wild cherry; later (Treatise on ins. injur. veg., 1862, p. 421-422) he adds to this description a poor figure of the larva and of the cocoon; he gives a brief note (Entom. corresp., 1869, p. 244-245) on the larva. Riley (Amer. entom. v. 2: Sept.-Oct. 1869, p. 25; Oct. 1870, p. 340) gives a good figure of the larva, which he states to feed on apple and Siberian crab-apple; he later (5th ann. rept. state entom. Mo., 1873, p. 126) gives this species in a list of larvae which have urticating power. Lintner (Entom. contrib., no. 3, 1874, p. 149) describes the cocoon, and adds plum, pear, and *Corylus americana* to the food-plants. This larva is rarely found in eastern Massachusetts and a little more abundant in the western part of the state; a favorite food-plant is *Betula alba*.

Orgyia leucostigma Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 157, pl. 79). Harris (Rept. ins. injur. veg., 1841, p. 261-263) describes the eggs, larva and imago of this species; apple and *Rosa* are given as food-plants. The same author (Treatise on ins. injur. veg., 1862, p. 366-368) figures and describes the eggs, larva, cocoon, and male and female imagos, and adds *Aesculus hippocastanum* to the food-plants; later (Entom. corresp., 1869, p. 291) he adds further *Salix*,

Celtis and *Carya* to the food-plants. Fitch (1st and 2nd rept. ins. N. Y., 1856, p. 202-220) describes the different stages of this species, noting in addition to food-plants mentioned above, *Ulmus*, *Acer*, *Quercus*, and plum. Riley (1st ann. rept. state entom. Mo., 1869, p. 144-147) figures and describes briefly the eggs, larva, pupa, cocoon and male and female imagos; the figure of the larva is repeated in Amer. entom., Sept. 1870, v. 2, p. 306. Saunders (Can. entom., Apr. 1871, v. 3, p. 14-15) repeats Riley's figure of the larva, and describes the egg and egg-mass. Packard (Bull. 7, U. S. entom. comm., 1881, p. 239) repeats Riley's figures of the different stages of this species. Coleman (Papilio, Nov.-Dec. 1882, v. 2, p. 164-166) describes some variations in the coloration of the larvae. Clarkson (Can. entom., Sept. 1883, v. 15, p. 168) mentions that this larva particularly attacks the silver-leaf *Populus*, and calls attention to the fact that ichneumonous oviposit in cocoons of this species. The larva feeds upon *Betula alba* and *B. lenta*.

Hyphantria textor Harr. (N. E. farmer, 22 Aug. 1828, v. 7, no. 5, p. 34). Harris, Rept. ins. injur. veg., 1841, p. 254-255) describes the larva, cocoon and imago of this species, giving apple and *Ulmus* as food plants of the larva; later (Treatise on ins. injur. veg., 1862, p. 357-358, pl. 7, fig. 10-12) he repeats these descriptions and adds figures of larva, cocoon, and pupa. Morris (Synop. lepid. N. A., 1862, p. 344) gives a brief description of larva and imago. Harris (Entom. corresp., 1869, p. 360) quotes the original descriptions of larva and imago. Riley [?] (Amer. entom., Nov. 1869, v. 2, p. 39) gives as food-plants, *Carya*, *Prunus serotina*, apple, crab, *Fraxinus*, *Ulmus*, *Salix*, *Quercus*, *Betula* and *Platanus*. Riley (3rd ann. rept. state entom. Mo., 1871, p. 130-132) describes and figures larva, pupa, and imago, adding *Juglans*, *Quercus*, hop-plantain, *Phaseolus* and *Heli-anthus*. Riley's figures are given, with descriptions, by Saunders (Can. entom., Aug. 1873, v. 5, p. 141-143) and by Packard (Bull. 7, U. S.

entom. comm., 1881, p. 67). The larvae also feed on *Syringa vulgaris*, *Ribes rubrum*, and *Betula alba*.

Spilosoma virginica Fabr. (Syst. entom., Suppl., 1775, p. 437). Harris (Rept. ins. injur. veg., 1841, p. 247-248) describes the larva and imago, stating that the larva feeds on leaves of *Plantago*, *Pisum*, *Phaseolus*, *Zea mays*, *gramineae*, *Vitis*, *Ribes rubrum* and *R. grossularia*; later (Treatise on ins. injur. veg., 1862, p. 349-351) he adds a figure of the larva and imago, and (Entom. corresp., 1869, p. 287-288) he describes the larva and pupa. Morris (Synop. lepid. N. A., 1862, p. 342-343) describes larva and imago. Riley (Amer. entom., July-Aug. 1870, v. 2, p. 272-273 and 3rd ann. rept. state entom. Mo., 1871, p. 68-69) describes and figures the larva, pupa, and imago, adding to the above-mentioned food-plants, *Fagulus cinerea*, *Syringa*, *Convolvulus*, *Gossypium*, *Helianthus*, *Polygonum*, *Verbena* and *Geranium*; he also states that the larva has been known to subsist entirely, from the time it cast its last skin till it spun up, on dead bodies of the camel cricket (*Mantis carolina*): later (*op. cit.*, Oct. 1870, v. 2, p. 336) he adds *Petunia* and *Salix* to the food-plants. Lintner (Entom. contrib., no. 3, 1874, p. 143) describes two varieties of the larva. Bates (Can. entom., Jan. 1880, v. 12, p. 20) adds *Rumex* to the food-plants. Saunders (*op. cit.*, March 1880, v. 12, p. 56-57) reprints Riley's figures of the larva, pupa, and imago, and describes them. Packard (Bull. 7, U. S. entom. comm., 1881, p. 88-89) describes larva and imago (reprinting Riley's figures of these and the pupa) and adds *Rhamnus* and *Pinus* to the food-plants. The larva also eats *Ampelopsis quinquefolia*, *Ulmus americana*, *Betula alba*, *Fuchsia fulgens*, *Tropaeolum*, *Prunus serotina*, *Syringa vulgaris*, *Vitis labrusca*, *Ipomoea purpurea*, *Pelargonium*, *Martynia proboscidea*, *Acer saccharinum*, *Ricinus communis*, *Lappa officinalis*, and *Nicotiana tabacum*, but specimens fed on *Datura meteloides* died soon after.

Spilosoma isabella Abb.—Smith (Nat. hist. lepid. ins. Ga., 1797, v. 2, p. 131, pl. 66). Har-

ris (Rept. ins. injur. veg., 1841, p. 252-253) describes larva and imago giving *Trifolium*, *Taraxacum dens-leonis*, and narrow-leaved *Plantago* as food-plants; to this he adds (Treatise on ins. injur. veg., 1862, p. 355-356) a figure of the larva. Walsh [?] (Pract. entom., June 1867, v. 2, p. 103) gives apple as a food-plant of the larva. Riley (Amer. entom., April 1870, v. 2, p. 182) figures and briefly describes the larva, pupa, and imago, mentioning only grass as a food-plant of the larva; later (4th ann. rept. state entom. Mo., 1872, p. 143-144) he reprints these figures. Riley's figures, with a brief description, are again repeated by Saunders (Can. entom., April 1873, v. 5, p. 75-77, and Ann. rept. entom. soc. Ontario, 1873, p. 22-23), and Westcott (Can. entom., July 1873, p. 137) adds a few notes on the larva. Siewers (Can. entom., July 1877, v. 9, p. 127-128) notes a few habits of the larva. Mann (Psyche, Sept.-Dec. 1879 [9 Apr. 1880], v. 2, p. 270) gives some notes on the larva. Riley (Amer. entom., June 1880, v. 3, p. 133-134) reprints his figures of larva, pupa, and imago, and adds some notes on the larva and its parasites. Coleman (Papilio, Jan. 1882, v. 2, p. 18) gives some notes on the variations of color of the larva. Experiments show that the larva feeds readily on leaves of the following plants: *Ricinus communis*, *Acer saccharinum*, *Viburnum dentatum*, *Lappa officinalis*, *Polygonum persicaria*, *Tropaeolum majus*, *Vitis labrusca*, *Syringa vulgaris*, *S. persica*, *Ampelopsis quinquefolia*, *Prunus serotina*, *Ulmus americana*, *Clethra alnifolia*, *Martynia proboscidea*, *Helianthus annuus*, *Plantago major*, *Spiraea sorbifolia*, *Ribes aureum* and *Betula alba*; the larva refused *Solanum nigrum* and *Apios tuberosa*.

Ceratonia amyntor Hübn. (Samml. exot. schmetz., 1806-1824, v. 2, Lepid. 2. Sph. 3, leg. 4, mand. B. pond. 4) [= *C. quadricornis* Harr. (Amer. journ. sci. and arts, July 1839, [s. 1], v. 36, p. 293)]. Harris (*l. c.*) describes the larva and imago; the same author (Rept. ins. injur. veg., 1841, p. 227-228) briefly describes the larva and imago, and later (Treatise

on ins. injur. veg., 1862. p. 323-324) adds a figure of the larva and imago; still later (Entom. corresp., 1869. p. 282) he briefly describes the egg, young larva, and pupa. Morris (Synop. lepid. N. A., 1862. p. 205-206) describes larva, pupa, and imago. Lintner (Proc. Entom. soc. Phil., Dec. 1862. v. 1, p. 286-293) gives an excellent description of the egg, the five stages of the larva, and the pupa. Minot (Can. entom., Nov. 1869. v. 2, p. 28) describes the egg and the young larva; he states that the larva molts six times. Andrews (Can. entom., Feb. 1876. v. 8, p. 40) and Bunker (*op. cit.*, June 1876. v. 8, p. 120) discuss the brown form of the larva. The before-mentioned authors give only *Ulmus* as food-plant; Goodell (Psyche, July [Dec.] 1882. v. 3, p. 368) gives *Ulmus* and *Betula alba* as food-plants. Taken in Cambridge, Mass. oftener on *Betula alba* than on *Ulmus*.

Smerinthus excacatus Abb. & Smith (Nat. hist. lepid. ins. Ga., 1797, v. 1. p. 49. pl. 25). Harris (Amer. journ. sci. and arts, July 1839. [s. 1], v. 36. p. 290) gives a brief description of larva and imago of this species, which he states to feed upon apple and *Rosa carolina*; Morris (Syn. lepid. N. A., 1862. p. 209) gives Harris' description of the larva, with slight addition, and adds a description of the young larva, and of what he supposed to be the egg,—really, however, the egg of *Attacus polyphemus*. Harris (Treatise on ins. injur. veg., 1862. p. 327-328) describes and figures the imago. Lintner (Proc. Entom. soc. Phil., 1864. v. 3, p. 666) describes the larva, without knowing the species, and later (Entom. contrib., no. 2. 1873. p. 23) he gives its name, and states that the larva described by him (Proc. Entom. soc. Phil., 1864. v. 3, p. 665) as *S. excacatus* was in reality *S. geminatus*. Sanborn (Can. entom., Jan. 1869. v. 1, p. 48) calls attention to the squeaking noise produced by the larva of this and of other species of *Smerinthus*. Lintner (Entom. contrib., [no. 1], 1869. p. 56) gives *Prunus pennsylvanica* and *Crataegus* as food-plants of the larva. Mann (Psyche, Sept.-Oct. 1877 [8 Mar. 1878], v. 2, p. 69-72) compares descrip-

tions of the larva of this and of other species of *Smerinthus*, giving *Aver* as food-plant of the larva of *S. excacatus*. Goodell (Psyche, July [Dec.] 1882. v. 3, p. 368) describes egg and first larval stage of this species. Fletcher (Can. entom., Nov. 1883. v. 15, p. 203-204) gives as food-plants apple, plum, wild cherry, *Populus balsamifera* and *P. alba*, and further states that the larvae varied much in coloration. Saunders (Can. entom., Jan. 1884. v. 16, p. 9-11) describes and figures the last stage of the larva and the imago. Fischer (*op. cit.*, p. 17) adds *Tilia* and *Salix* to the food-plants. In Cambridge, Mass., the larva of this species is not rare on low shrubs of *Betula alba*, where it occurs throughout August and September. The larvae, as observed on *Betula alba*, exhibit no variation. They are somewhat difficult to rear; of 38 larvae, of which rearing was begun, 8 were put in alcohol for preservation; three produced imagos (2♂ and 1♀); 16 died without apparent parasitism, while 11 were killed by *Thyreodon morio*, of which ichneumon only 2 reached the imago state. One of the pupae of *Thyreodon* produced a large number of minute hymenoptera—secondary parasites. The egg of *S. excacatus* often harbors very minute hymenopterous parasites; more than thirty of these hymenoptera sometimes emerge from a single egg of *Smerinthus*, a fact that will give an idea of their microscopical minuteness.

Limenitis arthemis Drury (Illust. nat. hist. . . . 1773. v. 2. pl. 10, fig. 3-4). Lintner (Proc. entom. soc. Phil., May 1864. v. 3, p. 62-63) describes the larva and pupa of this species, giving as larval food-plant *Populus balsamifera*. Scudder (Amer. nat., Aug. 1869. v. 3, p. 330) gives *Crataegus* as food-plant, and again (Psyche, Aug. 1874. v. 1, p. 13) adds *Betula lenta* and *Populus* to the food-plants.

Vaucsa antiopa Linn. (Syst. nat., 1758, ed. 10. p. 476). Besides numerous references in European literature, in which *Salix*, *Populus*, *Betula* and *Tilia* are noticed as food-plants, the following citations of American

authors may be mentioned. Harris (Rept. ins. injur. veg., 1841, p. 219, and Entom. corresp., 1869, p. 280) describes the larva of this species, adding *Ulmus* as food-plant; later (Treatise on ins. injur. veg., 1862, p. 296-298) he figures and describes larva, pupa, and imago. Packard (Guide study ins., 1869, p. 258) and Saunders (Can. entom., April 1869, v. 1, p. 75) describe the larva.

Papilio turnus Linn. (Mantissa, 1767, v. 1, p. 536). Harris (Treatise on ins. injur. veg., 1862, p. 268-269) describes and figures the larva and imago of this species, which is stated to feed on wild cherry. Morris (Synop. lepid. N. A., 1862, p. 2) describes larva and imago, giving for food-plant "various species of *Prunus*." Saunders (Can. entom., Feb. 1869, v. 1, p. 53-54) describes egg and young larva, and later (*op. cit.*, Apr. 1869, v. 1, p. 74) describes adult larva. Scudder (Amer. nat., Aug. 1869, v. 3, p. 330) gives as food-plants: apple, *Crataegus*, *Prunus virginiana*, cultivated cherry, *Alnus*, *Liriodendron tulipifera*, *Fraxinus sambucifolia*, *Betula*, *Tilia* and *Quercus*, and later (Can. entom., May 1872, v. 4, p. 84), on authority of Abbot, gives *Fraxinus trifoliata* and *F. ?platycarpa*. Saunders (Can. entom., Jan. 1874, v. 6, p. 2-5) describes and figures larva and imago, and (*op. cit.*, Nov. 1883, v. 15, p. 204) adds *Magnolia acuminata* to the recorded food-plants. Gruber (Papilio, May 1884, v. 4, p. 86-87) gives notes on the five stages of the larva.

COLEOPTERA.

Chlamys plicata Fabr. (Entom. syst., Suppl., 1794, p. 111). This species is sometimes found feeding, as imago, on *Betula alba*. The larvae feed on *Quercus*, *Platanus*, *Rubus* and *Comptonia asplenifolia*. Riley (6th. ann. rept. state entom. Mo., 1874, p. 128-129) describes egg, larva and pupa; and Packard (Guide study insects, 1869, p. 510) describes and figures the larva and its case.

Gonioctena pallida Linn. (Syst. nat., 1758, ed. 10, p. 370). Cornelius (Entom. zeit. . . zu Stettin, 1850, jahrg. 11, p. 19-20) describes

the larva of this species, which, according to Gyllenhal, among other plants, feeds upon *Betula alba*.

Syneta tripla Say (Journ. Acad. nat. sci. Phil., 1827, v. 5, p. 281) eats leaves of *Betula*, according to Fitch (Ann. rept. N. Y. state agric. soc., 1858, v. 18, p. 853). Packard (Bull. 7, U. S. entom. comm., 1881, p. 128) briefly describes this beetle.

Tylonotus bimaculatus Hald. (Trans. Amer. philos. soc., 1847, v. 10, p. 38) is said by Packard (Bull. 7, U. S. entom. comm., 1881, p. 129) on authority of G. Hunt, to be found "Under bark of white or paper birch, northern New York."

Gracilia minuta Fabr. (Spec. ins., 1781, v. 1, p. 235). Lugger (Psyche, Aug.-Sept. 1884, v. 4, p. 204) mentions breeding this species from a band of wood (*Betula lenta*) around a gin-barrel.

Bellamira scalaris Say (Journ. acad. nat. sci., 1827, v. 5, p. 278-279). Packard (Bull. 7, U. S. entom. comm., 1881, p. 129) writes, on authority of G. Hunt, "Beetle and pupa found under the bark of the yellow birch in July, northern New York."

Clytus? Packard (3rd rept. U. S. entom. comm., 1883, p. 259; pl. 12, fig. 3) mentions and figures the mouth-parts of a larva from "black birch, "nearly allied if not identical with *Xylotrechus colonus*."

Aphrastus taeniatus Gyll. (Schönh., Synon. insectorum, Gen. et spec. curcul., 1834, t. 2, p. 460). Good description in Le Conte and Horn's Rhynchophora of Amer. north of Mex. (Proc. Amer. philos. soc., 1876, v. 15), p. 99. This species is not rare in Cambridge, Mass., on *Betula alba*.

Dendroides concolor Newm. (Entom. mag., 1838, v. 5, p. 375). G. Dimmock has a specimen in his collection, which he reared from the bark of *Betula papyracea* at the White Mts., N. H., the beetle emerging 8 July 1874.

Dendroides canadensis Latreille (Consid. génér., 1810, p. 212). Schaupp (Bull. Brooklyn entom. soc., July 1881, v. 4, p. 23) writes of this species, "Pupae in birch July 19, in beech July 23." G. Dimmock found a pupa

of this species, 30 June 1874, under decayed bark of *Betula papyracea*, on Mt. Washington, N. H.; the beetle emerged from this pupa 8 July 1874.

Meraucantha contracta Beauv. (Ins. Afr. et Amer., 1805, p. 121, pl. 30, fig. 2). Halde- man (Proc. Amer. assoc. advanc. sci., 1850, v. 2, p. 347) briefly notices the larva of this species. Specimens in the collection of G: Dimmock were taken at Suffield, Conn., by Leroy H. Sykes, in decaying bark of *Betula lutea*.

Bolitotherus bifurcus Fabr. (Entom. syst., Suppl., 1794, p. 40). The larvae, pupae and imago of this species are found in *Polyporus betulinus*, which grows on dead birch trees. Larva, pupa, and a male imago are figured by Packard (Guide study ins., 1869, p. 474). Kirby, as quoted by Bethune (Can. entom., Nov. 1873, v. 5, p. 211), says that this species is found in a boletus of the birch. Some habits of this beetle are mentioned by Harrington (Can. entom., Dec. 1882, v. 12, p. 260-261). Candéze (Mém. soc. sci. Liège, 1861, v. 16, p. 365-368, pl. 3, fig. 9) gives a detailed description of the larva, with figure; and HAYWARD (Bull. Bost. zool. soc., July 1882, v. 1, p. 35-36) briefly describes the larva and pupa.

Hoplocéphala bicornis Fabr. (Gen. ins. mant., 1777, p. 215). This insect feeds upon different kinds of fungi, some of them parasitic on decaying wood of *Betula*. Kirby's description of the imago is quoted by Bethune (Can. entom., Nov. 1873, v. 5, p. 210-211). Harrington (*l. c.*, Dec. 1880, v. 12, p. 261) mentions its fungivorous habits.

Diaperis hydni Fabr. (Syst. eleuth., 1801, v. 2, p. 585). This species, both as larva and imago, feeds upon *Polyporus betulinus*, a fungus that grows on dead trees of *Betula alba*, and the beetles, according to G: Dimmock, are often very abundant about the first of July. Harrington (Can. entom., Dec. 1880, v. 12, p. 261) briefly describes the imago.

Centronofus calcareatus Fabr. (Entom. syst., Suppl., 1794, p. 52). Coquillett (Can. entom., June 1883, v. 15, p. 102) describes

this larva very briefly. This larva is often very abundant in decaying birch wood.

Nyctobates pennsylvanica De Geer (Mém., 1775, v. 5, p. 52; pl. 13, fig. 10). Schaupp (Bull. Brooklyn entom. soc., July 1881, v. 4, p. 23) writes of this species, "Pupae in beech July 15; in hemlock July 18; in birch July 21."

Phellopsis obcordata Kirby (Fauna bor.-amer., 1837, pt. 4, p. 236). The larva of this species has been found by G: Dimmock, on Mt. Washington, N. H., in *Polyporus betulinus*, the large white fungus common on dead trees of *Betula alba*. The imago frequents the same fungus during June, July, and August.

Telephorus bilineatus Say (Journ. Acad. nat. sci. Phil., 1823, v. 3, p. 182). Packard (1st ann. rept. inj. and benefic. ins. Mass., 1871, p. 26-28, pl. 1, fig. 7-8) describes and figures larva and imago and writes that the pupa of this species "early in May becomes a beetle, when it eats the newly expanded leaves of the birch." Riley (4th ann. rept. state entom. Mo., 1872, p. 29-30) describes and figures the larva and imago, stating that the larva has been found to eat larvae of *Carpocapsa pomonella*.

Campylus denticornis Kirby (Fauna bor.-amer., 1837, pt. 4, p. 145). G: Dimmock has reared this species from larvae found in partly decayed bark of *Betula papyracea*, on Mt. Washington, N. H. The imagos emerge from the pupae about 1 July, and are abundant during July in the White Mts.

Melanotus ? parumpunctatus Melsh. (Proc. Acad. nat. sci. Phil., Nov. 1844, v. 2, p. 151-152). A *Melanotus*, probably this species, was taken in the same cavity with its pupal skin, in decaying wood of *Betula alba*, at Milton, Mass., 17 Oct. 1884.

Melanotus ? communis Gyllenhal (Schönh., Syn. ins., v. 1, pt. 3; App. 1817, p. 138-139.) A *Melanotus*, probably this species, was taken in decaying wood of *Betula alba*, at Milton, Mass., 17 Oct. 1884.

Elater protervus LeConte (Trans. Amer. philos. soc., 1853, s. 2, v. 10, p. 471). Two

specimens of this beetle were taken, 17 Oct. 1884, at Milton, Mass., in decaying wood of *Betula alba*, under circumstances that left no doubt that they were bred in the wood.

Elater nigricollis Herbst (Natur-syst. . . . ins.; Käfer, 1806, v. 10, p. 73, pl. 164, fig. 7). Coquillett (Can. entom., June 1883, v. 15, p. 101) briefly describes the larva, which he obtained from decayed wood of *Quercus*. Reared from decayed wood of *Betula alba*, the beetle emerging 3 May 1883 from wood collected the preceding April, in Cambridge, Mass.

Chrysobothris sexsignata Say (Trans. Amer. phil. soc., 1839, v. 6, p. 158). Packard (Bull. 7, U. S. entom. comm., 1881, p. 128) writes of this species, "Beetle and pupa found in the yellow birch June 1, Providence."

Cervachus piceus Weber (Observ. entom., 1801, p. 84). The pupae are mentioned by Fuchs (Bull. Brooklyn entom. soc., Dec. 1882, v. 5, p. 59) as being very common in an old beech stump, and are briefly described. The larvae are mentioned by G. Dimmock (Direct. collect. coleopt., 1872, p. 20) as living "in decayed chestnut and willow." The larvae are very abundant in decayed and fallen wood of *Betula alba* during autumn. Quite a large number of larvae taken in Milton, Mass., 10 Nov. 1883, fed through the winter and produced a single beetle. From these larvae were reared seven tachinid flies (allied to *Morinia*), which emerged from 4 June to 6 July 1884. The digestive tract of the larva of *C. piceus* is often inhabited by a microscopic undescribed nematod worm.

Macroductylus subsquosus Fabr. (Syst. entom., 1775, p. 39). This beetle devours the leaves of *Betula alba*. Its metamorphoses were described by Harris (Mass. agric. repos. and journ., 1827, v. 10, p. 1-12), and many subsequent descriptions and figures have been given, among which may be mentioned Fitch (1st and 2nd rept. ins. N. Y., 1856, p. 245-252), Packard (Guide study ins., 1869, p. 454), Riley (5th ann. rept. state entom. Mo., 1873, p. 108-110), Thomas (6th rept. state

entom. Ill., 1877, p. 103) and Lintner (1st ann. rept. state entom. N. Y., 1882, p. 227-232).

Dichelonycha elongatula Schönh. (Synon. insectorum, 1817, t. 1, theil 3, p. 210). Packard (Guide study ins., 1869, p. 454) says this species "is found in June on the leaves of the birch."

Thymalus fulgidus Erichson (Germar zeits., 1844, bd. 5, p. 458). G. Dimmock (Direct. collect. coleopt., 1872, p. 19-20) writes "The larvae feed upon a fungus (*Polyporus betulinus*) which is parasitic upon the trunks of white birch trees." This beetle is common in New England, and its larva agrees very closely with the description and figure of the larva of *T. limbatas* from Europe, as given by Chapuis and Candéze (Mem. Soc. sci. Liège, 1855, v. 8, p. 417-419, pl. 2, fig. 6). A large number of larvae, taken in Belmont, Mass., produced beetles after a short period of pupation, on or about 27 June 1878.

Trogosita corticalis Melsh. (Proc. Acad. nat. sci. Phil., Oct. 1844, v. 2, p. 109). Schaupp (Bull. Brooklyn entom. soc., July 1881, v. 4, p. 23) writes of this species, "Larvae in birch July 8, in beech Aug. 14, in sugar maple July 10."

Ips sanguinolentus Oliv. (Entom., 1780, v. 2, no. 12, p. 8; pl. 2, fig. 14). G. Dimmock (Can. entom., April 1871, v. 3, p. 15) notes that he found this species "about fresh-cut maple and birch stumps where the sap was flowing."

Ips fasciatus Oliv. (Entom., 1780, v. 2, no. 12, p. 7-8; pl. 2, fig. 13). G. Dimmock (Can. entom., April 1871, v. 3, p. 15) mentions that this species is found about fresh-cut stumps of *Betula* where the sap is flowing.

HYMENOPTERA.

Tremex columba Linn. (Syst. nat., 1758, ed. 10, p. 929). Harris (Rept. ins. injur. veg., 1841, p. 389-391) describes the egg, larva, and imago of this insect, giving wood

of pear. *Ulmus* and *Platanus* as food of the larva; and (Entom. corresp., 1869, p. 360) again describes the egg and imago. In Amer. entom., Nov. 1868, v. 1, p. 59, this species is mentioned as injuring oak and pear trees. Packard (Guide study ins., 1869, p. 228) quotes Harris' account of the habits of this species. Huggins (Amer. entom., Feb. 1870, v. 2, p. 128) found this insect ovipositing in an apple tree. Packard (Bull. '7. U. S. entom. comm., 1881, p. 105-106) figures the larva, which he states to attack *Ulmus*, *Quercus*, *Acer* and *Platanus*; and (*op. cit.*, p. 129) says, "In yellow birch at Providence." R. I. Harrington (Can. entom., Dec. 1882, v. 14, p. 225) gives some notes upon this species and adds *Fagus* to the food-plants.

Crocus latitarsus Norton (Proc. Entom. soc. Phil., 1862, v. 1, p. 199). Norton (*l.c.*) describes the male of this species and later (Trans. Amer. entom. soc., 1867, v. 1, p. 84) describes the female, and adds, "Bred by Mr. Walsh from larvae feeding on birch."

Nyphidria attenuata Norton (Proc. Entom. soc. Phil., 1862, v. 1, p. 144). Norton (*l.c.*, and Trans. Amer. entom. soc. 1869, v. 2, p. 354) describes the male of this species, and Patton (Can. entom., Jan. 1879, v. 11, p. 14-15) describes the female. Patton (*l.c.*) writes of his specimen, "Taken from a dead stick of *Betula nigra*," and mentions that *Rhyssa humida* is a parasite of this species.

NEW SOLVENT OF CHITIN.—Dr. Looss, assistant in the Zoological institute at Leipzig, has found that a solution of sodic hypochlorite (*eau de Labarraque* of the druggists), or of potassic hypochlorite (*eau de Javelle*), is a fine solvent for chitin in making microscopical preparations. He writes (*Zool. anzeiger*, 1 June 1885, jahrg. 8, p. 334):

"The liquid, as bought, completely dissolves, when heated, even the solidest and hardest chitinous parts of insects in a short time, first making them glass-like, transparent, and entirely colorless. If the liquid is diluted with six or seven times its volume of water, and the chitinous parts, either fresh or after they have been hardened, are put in it for twenty-four hours, or even longer according to size, the chitin will be altered, altho not noticeably externally; it loses much of its original brittleness,

and above all things is more permeable to staining solutions. The objects require, for complete staining greater or less time according to size, but the coloration is beautiful and distinct with either alcoholic or aqueous staining reagents. In our Institute *pediculidae* and *mallophaga* have been prepared by this method which show, besides their great transparency, complete and clear coloration. This is likewise the case with nematodes and their eggs. It is furthermore especially remarkable that by this treatment the underlying soft parts are entirely spared and admit studying upon them the finest structural relationships, such as the elementary structures of striate muscular fibres ('Muskelkästchen') and the nerve endings. Sections of bees' heads have been made which were as beautiful as could be desired. At all events this reagent deserves to be experimented with further."